

## Low Cost Expendable Launch Technology

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The official link for this solicitation is:

<http://www.acq.osd.mil/osbp/sbir/solicitations/sbir20152/index.shtml>

Agency:

Department of Defense

Release Date:

April 24, 2015

Branch:

n/a

Open Date:

April 24, 2015

Program / Phase / Year:

SBIR / Phase I / 2015

Application Due Date:

June 24, 2015

Solicitation:

[DoD 2015.2 SBIR Solicitation](#)

Close Date:

June 24, 2015

Topic Number:

SB152-008

Description:

There is a compelling DoD need to leverage emerging commercial entrepreneurial and defense technologies enabling lightweight, high-specific-energy liquid-rocket technology. Many established aerospace and emerging entrepreneurial companies are developing new rocket stage technologies that promise to reduce the cost of access to space. The goal of this topic is to leverage these investments to enable low-cost launch vehicles that minimize gross and dry weight while maximizing the propellant load, engine specific impulse and/or payload. Technological trends facilitating such lightweight stages include an ongoing computer/software revolution enabling affordable design, sophisticated software in lieu of mechanical complexity, integration, and test; micro-miniaturization of electronics and mechanical actuators; high strength-to-weight composites and nano-engineered materials; lightweight structural concepts and thermal protection; advanced manufacturing methods, high thrust/weight rocket engines and turbo-machinery; and novel high-density-impulse liquid propellants that are safe, cheap and easy to handle. The offeror must demonstrate a clear understanding of the system applications of the launch vehicle and the supporting technologies. A system application of interest to the government is modifying the launch vehicle as a low-cost upper stage for DARPA's Experimental Spaceplane (XS-1) program. Key design goals include balancing low gross mass with adequate velocity change, payload and manufacturing cost. Additionally, reusable launch concepts such as XS-1 may carry stages through either normal or longitudinally-oriented hardpoints/racks. Stages with efficient structural arrangements to cope with such load paths while remaining low in mass and cost are of interest. Other potential system applications include a wide range of commercial launch vehicles, tactical missiles, satellite integral propulsion and future boost-

glide tactical or air transport systems. Similarly, a clear understanding of the technology applications to XS-1 as well as other proposed military and commercial systems is also essential. Critical technologies could include lightweight structures and propulsion, high-density-impulse propellants, miniaturized avionics, modular components, altitude compensation and complementary aerodynamic/propulsion integration, and stability, guidance and control subsystems all integrated into the stage while keeping the system simple and affordable. Offerors may seek to design and fabricate an entire stage or only critical subsystems. PHASE I: Develop the design, manufacturing and test approach for fabricating extremely low-cost, high propellant mass fraction launch vehicles and upper stages for space access. Critical component or analytical risk reduction is encouraged. Identify potential system level and technology applications of the proposed innovation. Although multiple applications are encouraged, to help assess the military utility the proposed stage should be useful as an upper stage on the XS-1 experimental spaceplane. The stage(s) must be designed to support: 1) an ideal velocity change of up to 20,000 fps objective, 2) a payload of 3,000 lbs, 3) a gross mass of less than 30,000 lbs, 4) a unit fly away cost of